Name

Reg. No | Class

2EX

MATHEMATICS

[80 marks]

SEMESTER ONE EXAMINATION

Thursday, 14 May 2015

2 hours

Candidates answer on the Question Paper for section A

Additional material: Electronic Calculator
Geometrical Instruments
Answer Paper

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.
Write your name, register number and class on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **ALL** questions.
For **Section A**, write your answers in the spaces provided on the question paper.
For **Section B**, write your answers in the spaces on the separate answer paper provided.
If working is needed for any question, it must be shown with the answer.
Omission of essential working will result in loss of marks.
Write the brand and model of your calculator in the space provided below.

INFORMATION FOR CANDIDATES

You are expected to use a scientific calculator to evaluate explicit numerical expressions.
The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to **three** significant figures. Give answers in degrees to **one** decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is **80**.

Brand & Model of Calculator

For Examiner's Use	
Section A	40
Section B	40
Total	**80**

This question paper consists of **12** printed pages.

Setter: Mr. Gabriel Cheow

Vetter: Mr. Chio Kah Leong

69

For Examiner's Use

Section A (40 marks)

Answer **all** the questions.

For Examiner's Use

1 A map is drawn to a scale of 1: 25 000.

(a) This scale represents 1 cm : n km. Find n.

Answer (a) n =..... [1]

(b) The distance between two towns on the map is 30 cm.
Find the actual distance, in kilometres, between the two towns.

Answer (b) ..... km [1]

(c) A lake has an actual area of 2.5 km^2.
Find the area, in square centimetres, of the lake on the map.

Answer (c) ..... cm^2 [2]

For Examiner's Use

2 y is directly proportional to x^3
It is also given that $y = 24$ when $x = 2$.

(a) Find the equation connecting y and x.

Answer (a) ..... [2]

(b) Hence, find the value of y when $x = 3$.

Answer (b) ..... [1]

For Examiner's Use

3 The force of attraction, F newtons, between two magnets is inversely proportional of the square of the distance, d centimetres, between them.

When the magnets are at a certain distance apart, the force is 1.25 newtons.

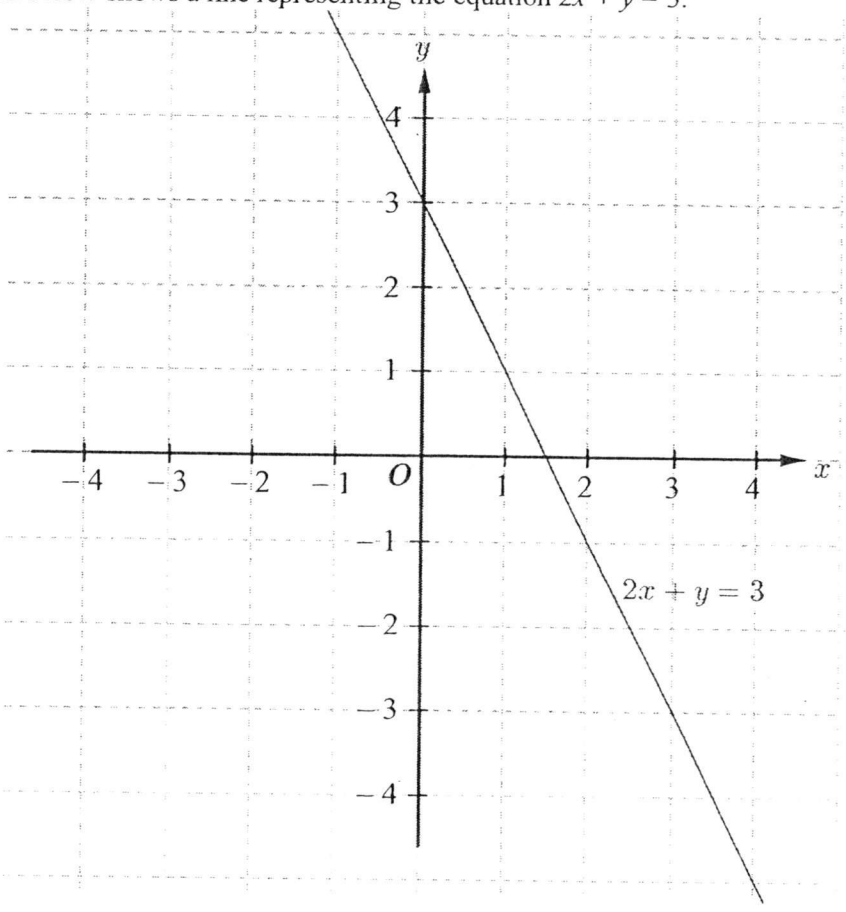
Find the force when the distance is halved.

Answer ..... newtons [2]

70

For Examiner's Use

4 The graph below shows a line representing the equation $2x + y = 3$.



(a) Draw and label the line representing the equation $y = \frac{1}{2}x - 2$ on the same diagram above. [1]

(b) Hence, solve the simultaneous linear equation.

$$2x + y = 3$$
$$y = \frac{1}{2}x - 2$$

Answer (b) $x =$ ..... , $y =$ ..... [1]

(c) Write down the equation of a line that passes through the origin and is parallel to the line $2x + y = 3$.

Answer (c) $y =$ ..... [2]

For Examiner's Use

5 Solve the following equations

(a) $2(x+3)-5(1-x)=7$,

Answer (a) $x =$ ..... [2]

(b) $\dfrac{x-2}{2x+1}=\dfrac{1}{4}$.

Answer (b) $x =$ ..... [2]

For Examiner's Use

6 **(a)** Factorise x^2+5x-6.

Answer (a) .....[2]

(b) Hence, using your result in **(a)**, factorise $(y-4)^2+5(y-4)-6$.

Answer (b) .....[1]

71

For Examiner's Use

7 Solve the following simultaneous linear equation.

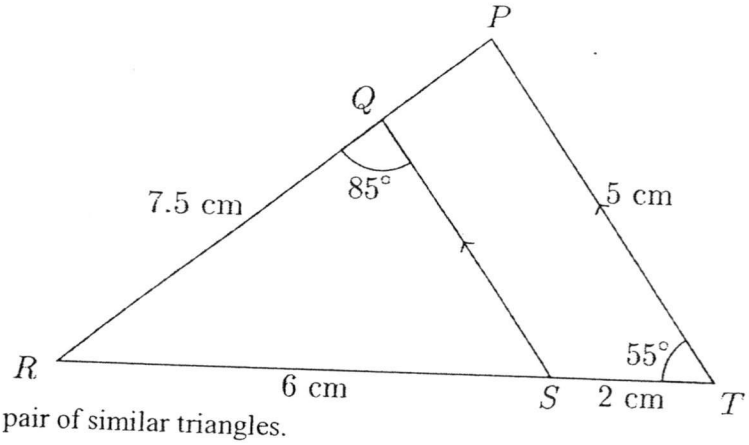
$$3x - 2y = 8$$
$$4x + 3y = 5$$

Answer $x =$ ..... , $y =$ .....[3]

For Examiner's Use

For Examiner's Use

8 In the diagram below, line TP is parallel to line SQ, QR is 7.5 cm, RS is 6 cm, ST is 2 cm and TP is 5 cm, $\angle RQS = 85°$ and $\angle RTP = 55°$.



(a) Name a pair of similar triangles.

Answer (a) Δ..... and Δ..... [1]

(b) Find $\angle PRT$.

Answer (b) $\angle PRT$ = ...° [2]

(c) Find the length of SQ.

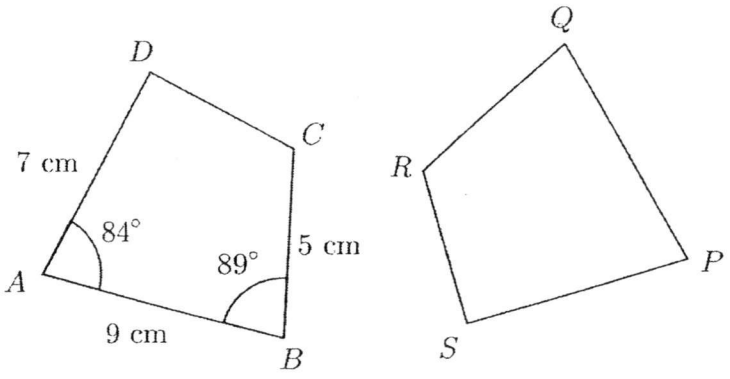
Answer (c) SQ = ... cm [2]

(d) Find $\dfrac{\text{area of } \Delta PRT}{\text{area of } \Delta RQS}$.

Answer (d) ..... [2]

For Examiner's Use

9 The quadrilaterals $ABCD$ and $PQRS$ are congruent (not drawn to scale).



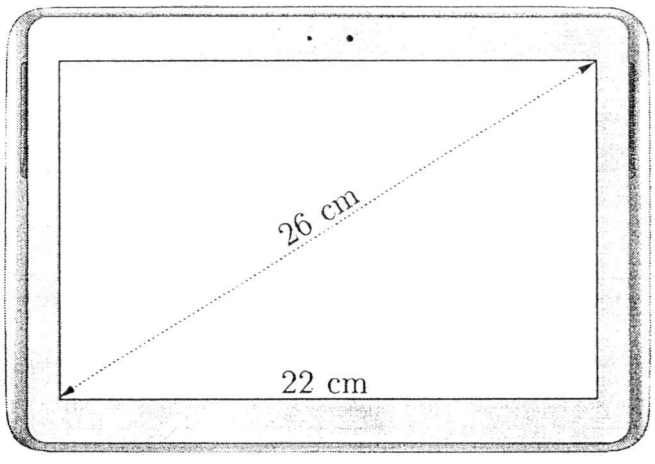
(a) Write down the length of PQ.

Answer (a) $PQ =$ ..... cm [1]

(b) Write down $\angle PQR$.

Answer (b) $\angle PQR =$ .....° [1]

10 The figure below is an electronic tablet.
Some of the dimensions for its rectangular screen are shown below.

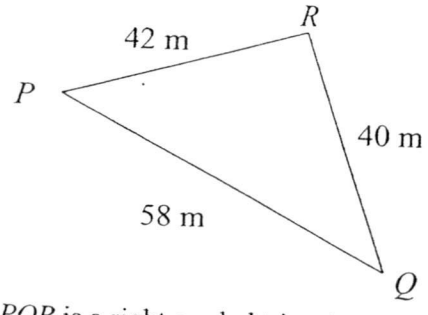


Find the height of the screen.

Answer ..... cm [2]

For Examiner's Use

11 The diagram shows a triangular piece of land PQR with the dimensions $PQ = 58$ m, $QR = 40$ m and $RP = 42$ m.



(a) Prove that triangle PQR is a right-angled triangle.

[2]

(b) Find the area of the piece of land.

Answer (b) ..... m^2 [2]

(c) Find the shortest distance from R to PQ.

Answer (c) ..... m [2]

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Section B (40 marks)

Answer **all** the questions on the separate answer paper provided.

12 Expand and simplify the following

(a) $2(x^2 - 3x + 2) - 3(x^2 + x - 2)$, [1]

(b) $(2x - 3)(x^2 - 2x - 4)$, [2]

(c) $3x^2 + 1 - 2(x + 1)^2$. [3]

---

13 **(a)** **(i)** Expand $(a - b)^2$. [1]

(ii) Hence, using your result in **(a)(i)**, evaluate 98^2. [2]

(b) If $(x - y)^2 = 57$ and $xy = 4$, find the value of $(x + y)^2$. [2]

---

14 Factorise the following completely

(a) $2n^2 - 18$, [2]

(b) $pq - 2q + 2 - p$. [2]

---

15 Express the following as a single fraction in its simplest form

(a) $\dfrac{4}{3x}+\dfrac{1}{2+x}$, [2]

(b) $\dfrac{3xy^3}{8z^2}\div\dfrac{9y^2}{10xz}$, [2]

(c) $\dfrac{3}{2x-1}-\dfrac{6x-1}{(2x-1)^2}$. [3]

---

16 **(a)** Express $\dfrac{1}{x-2}\times\dfrac{6-x-x^2}{1-x}$ as a single fraction. [2]

(b) Hence, or otherwise, solve the equation $\dfrac{1}{x-2}\times\dfrac{6-x-x^2}{1-x}=5$. [2]

---

17 It is given that $Q=\sqrt{\dfrac{3P-1}{2P+1}}$.

(a) If $P=2$, find the value of Q. [2]

(b) Make P the subject of the formula. [3]

(c) Hence, or otherwise, find the value of P when $Q=2$. [2]

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18 The time taken, t minutes, to pack all the Examination Care Packs is inversely proportional to the number of students, N, involved in the packing.

If a team of 3 students take 50 minutes to pack all the Examination Care Packs, how many **more** students are needed if the packing must be completed 20 minutes earlier? [3]

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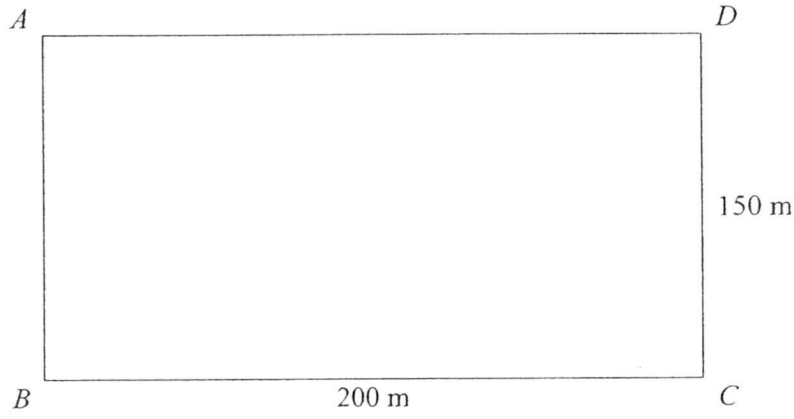
19 The diagram below shows a rectangular field $ABCD$ (not drawn to scale) with dimensions 200 m by 150 m.



(a) Find the distance from point A to point C. [2]

(b) Mr. Cheow bought a new remote-controlled helicopter drone, and wants to fly it by standing at point A. The remote control has a maximum range of 225 m. Can the maximum range cover the whole field from where he stands? Explain why.

[2]

– End of Paper –

Name

MARK SCHEME

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MATHEMATICS

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For Examiner's Use

Section A (40 marks)

Answer **all** the questions.

For Examiner's Use

1 A map is drawn to a scale of 1: 25 000.

(a) This scale represents 1 cm : n km. Find n.

$$1:25000 = 1\ cm : 25000\ cm$$
$$= 1\ cm : 250\ m$$
$$= 1\ cm : 0.25\ km$$

Answer (a) n = 0.25 … [B1] [1]

(b) The distance between two towns on the map is 30 cm.
Find the actual distance, in kilometres, between the two towns.

$$1\ cm : 0.25\ km$$
$$= 30\ cm : 30 \times 0.25\ km$$
$$= 30\ cm : 7.5\ km$$

Answer (b) 7.5 … [B1] km [1]

(c) A lake has an actual area of 2.5 km^2.
Find the area, in square centimetres, of the lake on the map.

$$Ratio\ of\ area = square\ of\ map\ scale$$
$$= (1\ cm)^2 : (0.25km)^2$$
$$= 1\ cm^2 : 0.0625\ km^2 \ \ldots\ldots\ldots [M1]$$
$$= 16\ cm^2 : 1\ km^2$$
$$= 2.5 \times 16 cm^2 : 2.5\ km^2$$
$$= 40\ cm^2 : 2.5\ km^2$$

Answer (c) 40 … [A1] cm^2 [2]

For Examiner's Use

2 y is directly proportional to x^3
It is also given that $y = 24$ when $x = 2$.

(a) Find the equation connecting y and x.

$$y \propto x^3$$
$$y = kx^3$$
$$24 = k(2)^2$$
$$24 = 8k$$
$$k = 3 \ldots\ldots\ldots\ldots [M1]$$
$$\therefore y = 3x^3$$

Answer (a) $y = 3x^3$ ...[A1] [2]

(b) Hence, find the value of y when $x = 3$.

$$Let\ x = 3\ in\ y = 3x^3$$
$$y = 3(3)^3$$
$$= 81$$

Answer (b) 81 ... [B1] [1]

3 The force of attraction, F newtons, between two magnets is inversely proportional of the square of the distance, d centimetres, between them.

When the magnets are at a certain distance apart, the force is 1.25 newtons.

Find the force when the distance is halved.

$$F \propto \frac{1}{d^2}$$
$$F = \frac{k}{d^2}$$
$$When\ d = a, F = 1.25$$
$$1.25 = \frac{k}{a^2}$$

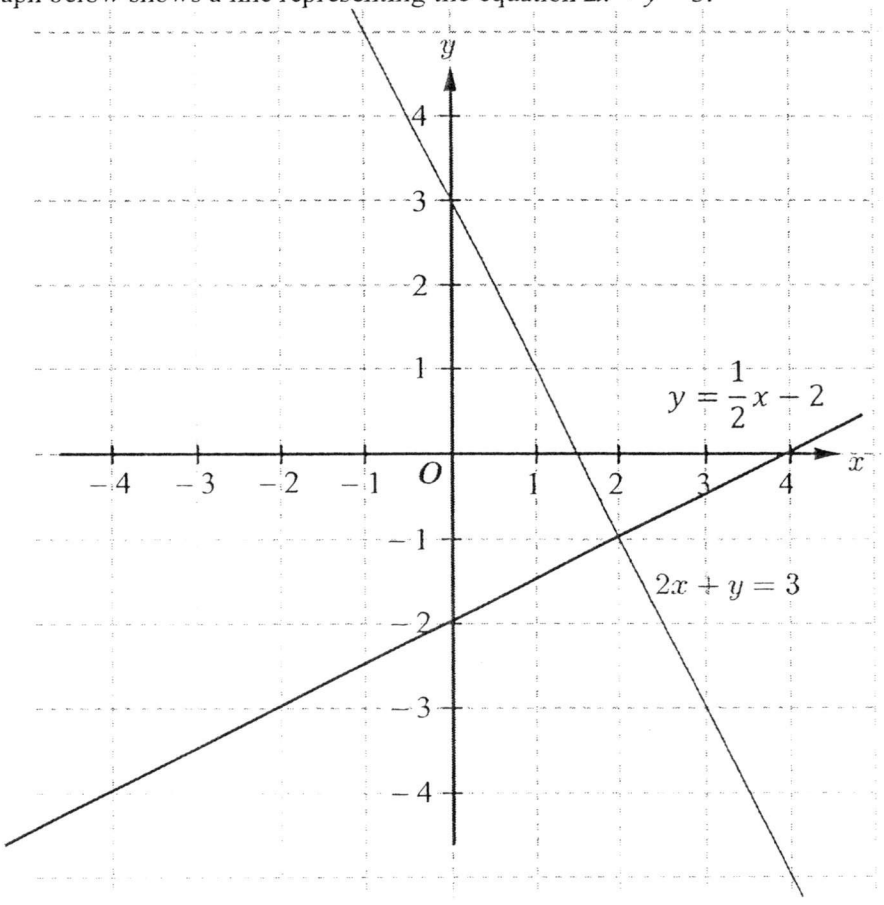
$$When\ d = \frac{1}{2}a,$$
$$F = \frac{k}{\left(\frac{1}{2}a\right)^2} \ldots\ldots [M1]$$
$$= \frac{k}{\frac{1}{4}a^2}$$
$$= 4 \times \frac{k}{a^2}$$
$$= 4 \times 1.25$$
$$= 5$$

Answer 5 ... [A1] newtons [2]

76

For Examiner's Use

4 The graph below shows a line representing the equation $2x + y = 3$.



(a) Draw and label the line representing the equation $y = \frac{1}{2}x - 2$ on the same diagram above. [1]

(b) Hence, solve the simultaneous linear equation.

$$2x + y = 3$$
$$y = \frac{1}{2}x - 2$$

Answer (b) $x = 2$, $y = -1$ (both x and y must be correct for B1) [1]

(c) Write down the equation of a line that passes through the origin and is parallel to the line $2x + y = 3$.

$$2x + y = 3$$
$$y = -2x + 3 \ldots\ldots [M1]$$
$$\therefore m = -2, c = 0$$

Answer (c) $y = -2x \ldots$ [A1] [2]

For Examiner's Use

5 Solve the following equations

(a) $2(x+3)-5(1-x)=7$,

$$\begin{aligned} 2(x+3)-5(1-x) &= 7 \\ 2x+6-5+5x &= 7 \\ 7x+1 &= 7 \ldots\ldots\ldots [M1] \\ 7x &= 6 \\ x &= \frac{6}{7} \end{aligned}$$

Answer (a) $x = \frac{6}{7}$ ... [A1] [2]

(b) $\dfrac{x-2}{2x+1} = \dfrac{1}{4}$.

$$\begin{aligned} \frac{x-2}{2x+1} &= \frac{1}{4} \\ 4(x-2) &= 2x+1 \ldots\ldots\ldots [M1] \\ 4x-8 &= 2x+1 \\ 4x-2x &= 8+1 \\ 2x &= 9 \\ x &= \frac{9}{2} \text{ or } 4\frac{1}{2} \text{ or } 4.5 \end{aligned}$$

Answer (b) $x = \frac{9}{2}$ or $4\frac{1}{2}$ or 4.5 ... [A1] [2]

6 **(a)** Factorise $x^2 + 5x - 6$.

Correct factorisation using cross method or multiplication frame [M1]

Answer (a) $(x + 6)(x - 1)$ [A1 or B2] [2]

(b) Hence, using your result in **(a)**, factorise $(y-4)^2 + 5(y-4) - 6$.

$$\begin{aligned} &Let\ x = y-4 \\ (y-4)^2 + 5(y-4) - 6 &= (y-4+6)(y-4-1) \\ &= (y+2)(y-5) \end{aligned}$$

[B1 when both working shows result in (a) used and answer is correct]

Answer (b) $(y + 2)(y - 5)$ [1]

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For Examiner's Use

7 Solve the following simultaneous linear equation.

$$3x - 2y = 8$$
$$4x + 3y = 5$$

$$3x - 2y = 8 \cdots\cdots\cdots (1)$$
$$4x + 3y = 5 \cdots\cdots\cdots (2)$$

$$From\ (1): -2y = -3x + 8$$
$$2y = 3x - 8$$
$$y = \frac{3}{2}x - 4 \cdots\cdots\cdots (3)$$

[M1 for showing the substitution method, or successfully eliminated x or y]

Substitute (3) into (2):

$$4x + 3\left(\frac{3}{2}x - 4\right) = 5$$
$$4x + \frac{9}{2}x - 12 = 5$$
$$\frac{17}{2}x = 17$$
$$x = 2$$

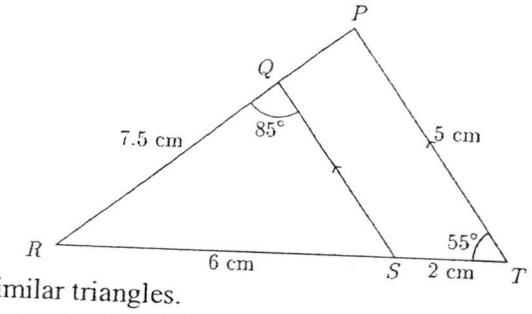
Substitute $x = 2$ into (1):

$$3(2) - 2y = 8$$
$$6 - 2y = 8$$
$$-2y = 2$$
$$y = -1$$

Answer $x = 2$ [A1] , $y = -1$ [A1] [3]

For Examiner's Use

8 In the diagram below, line TP is parallel to line SQ, QR is 7.5 cm, RS is 6 cm, ST is 2 cm and TP is 5 cm, $\angle RQS = 85°$ and $\angle RTP = 55°$.



(a) Name a pair of similar triangles.
[B1 for a naming the correct pair, with vertices in the correct order]
Other answers:
RSQ & RTP , SQR & TPR , SRQ & TRP , QRS & PRT , QSR & PTR

Answer (a) ΔRQS and ΔRPT [1]

(b) Find $\angle PRT$.

$$\begin{aligned}\angle TPR &= \angle SQR \\ &= 85° \\ \angle PRT &= 180° - \angle TPR - \angle PTR \\ &= 180° - 85° - 55° \ldots\ldots\ldots [M1] \\ &= 40°\end{aligned}$$

Answer (b) $\angle PRT = 40$ … [M1]° [2]

(c) Find the length of SQ.

$$\begin{aligned}Scale\ factor &= \frac{RS}{RT} = \frac{6}{8} \ldots\ldots\ldots [M1] \\ SQ &= \frac{6}{8} \times 5 \\ &= 3.75\end{aligned}$$

Answer (c) $SQ = 3.75$ … [A1] cm [2]

(d) Find $\dfrac{\text{area of } \Delta PRT}{\text{area of } \Delta RQS}$.

$$\begin{aligned}Ratio\ of\ area &= square\ of\ length \\ &= \frac{8^2}{6^2} \ldots\ldots\ldots [M1] \\ &= \frac{64}{36} \\ &= \frac{16}{9}\end{aligned}$$

Alternative solution ⇒

Let height of ΔPRT be h_1.
Let height of ΔRQS be h_2.

$$\begin{aligned}\frac{h_1}{h_2} &= \frac{8}{6} \\ \frac{area\ of\ \Delta PRT}{area\ of\ \Delta RQS} &= \frac{0.5 \times h_1 \times 8}{0.5 \times h_2 \times 6} \quad [M1] \\ &= \frac{0.5 \times 8}{0.5 \times 6} \times \frac{h_1}{h_2} \\ &= \frac{4}{3} \times \frac{8}{6} \\ &= \frac{16}{9}\end{aligned}$$

Answer (d) $\frac{16}{9}$ … … [A1] [2]

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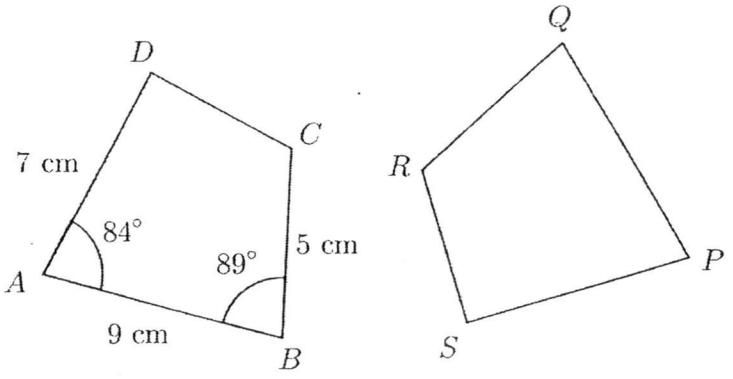
For Examiner's Use

9 The quadrilaterals $ABCD$ and $PQRS$ are congruent (not drawn to scale).



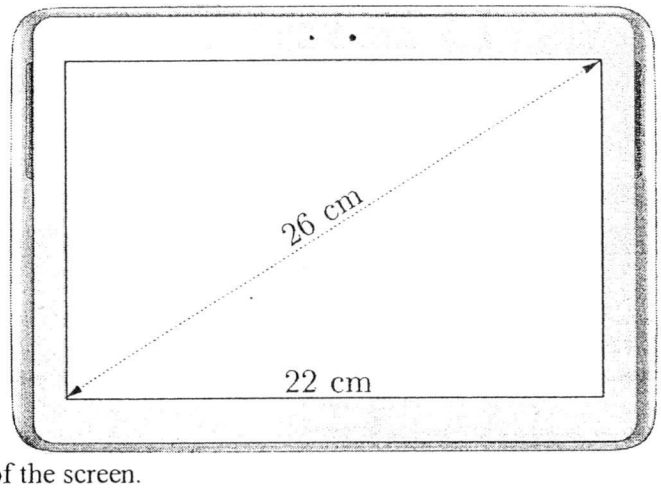
(a) Write down the length of PQ.

Answer (a) $PQ = 9$ [B1] cm [1]

(b) Write down $\angle PQR$.

Answer (b) $\angle PQR = 89$ [B1]° [1]

10 The figure below is an electronic tablet.
Some of the dimensions for its rectangular screen are shown below.



Find the height of the screen.

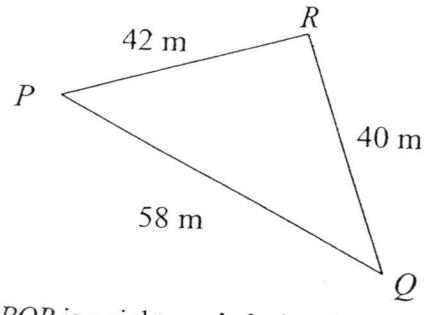
Let height be h cm.
By Pythagoras' Theorem,

$$22^2 + h^2 = 26^2$$
$$h^2 = 26^2 - 22^2 \ldots\ldots [M1]$$
$$= 192$$
$$h = \sqrt{192}$$
$$= 13.85640 \ldots$$
$$= 13.8\ (3sf)$$

Answer 13.8 [A1] cm [2]

For Examiner's Use

11 The diagram shows a triangular piece of land PQR with the dimensions $PQ = 58$ m, $QR = 40$ m and $RP = 42$ m.



(a) Prove that triangle PQR is a right-angled triangle.

$$QR^2 + PR^2 = 40^2 + 42^2$$
$$= 3364$$

$$PQ^2 = 58^2$$
$$= 3364$$

$$\therefore PQ^2 = QR^2 + PR^2 \ldots\ldots\ldots\ldots [M1]$$
$$\therefore By\ converse\ of\ Pythagoras\ Theorem, \ldots\ldots\ldots\ldots [A1]$$
$$\Delta PQR\ is\ a\ right-angled\ triangle.$$

[2]

(b) Find the area of the piece of land.

$$Area = \frac{1}{2} \times 42 \times 40 \ldots\ldots\ldots [M1]$$
$$= 840$$

Answer (b) 840 [A1] m^2 [2]

(c) Find the shortest distance from R to PQ.

Let shortest distance be d.

$$\frac{1}{2} \times d \times 58 = 840 \ldots\ldots\ldots\ldots [M1]$$
$$d = 840 \times 2 \div 58$$
$$= 28\frac{28}{29}$$
$$= 28.9655 \ldots$$
$$= 29.0\ (3sf)$$

Answer (c) 29.0 or $28\frac{28}{29}$ [A1] m [2]

79

Section B (40 marks)

12 Expand and simplify the following

(a) $2(x^2-3x+2)-3(x^2+x-2)$, [1]

$$2(x^2-3x-2)-3(x^2+x-2) = 2x^2-6x+4-3x^2-3x+6$$
$$= -x^2-9x+10 \ldots\ldots\ldots\ldots\ldots\ldots [B1]$$

(b) $(2x-3)(x^2-2x-4)$ [2]

$$(2x-3)(x^2-2x-4) = 2x(x^2-2x-4)-3(x^2-2x-4) \ldots [M1]$$
$$= 2x^3-4x^2-8x-3x^2+6x+12$$
$$= 2x^3-7x^2-2x+12 \ldots\ldots\ldots\ldots\ldots\ldots [A1]$$

(c) $3x^2+1-2(x+1)^2$. [3]

$$3x^2+1-2(x+1)^2 = 3x^2+1-2(x^2+2x+1) \ldots [M1]$$
$$= 3x^2+1-2x^2-4x-2 \ldots\ldots [M1]$$
$$= x^2-4x-1 \ldots\ldots\ldots\ldots\ldots\ldots [A1]$$

---

13 **(a)** **(i)** Expand $(a-b)^2$. [1]

$$(a-b)^2 = a^2-2ab+b^2 \ldots\ldots [M1]$$

(ii) Hence, using your result in **(a)(i)**, evaluate 98^2. [2]

Let $a = 100$, b = 2.

$$98^2 = (100-2)^2$$
$$= 100^2-2(100)(2)+2^2 \ldots\ldots [M1]$$
$$= 10000-400+4$$
$$= 9604 \ldots\ldots\ldots\ldots\ldots\ldots [A1]$$

(b) If $(x-y)^2 = 57$ and $xy = 4$, find the value of $(x+y)^2$. [2]

$$(x-y)^2 = x^2-2xy+y^2$$

$$x^2-2xy+y^2 = 57$$
$$x^2-2(4)+y^2 = 57$$
$$x^2-8+y^2 = 57$$
$$x^2+y^2 = 65 \ldots\ldots\ldots [M1]$$

$$(x+y)^2 = x^2+2xy+y^2$$
$$x^2+2xy+y^2 = 65+2(4)$$
$$= 73 \ldots\ldots\ldots\ldots [A1]$$

---

14 Factorise the following completely

(a) $2n^2-18$ [2]

$$2n^2-18 = 2(n^2-9) \ldots\ldots\ldots\ldots\ldots [M1]$$
$$= 2(n+3)(n-3) \ldots\ldots\ldots [A1]$$

(b) $pq-2q+2-p$. [2]

$$pq-2q+2-p = q(p-2)-(p-2) \ldots\ldots [M1]$$
$$= (q-1)(p-2) \ldots\ldots\ldots\ldots [A1]$$

---

15 Express the following as a single fraction in its simplest form

(a) $\frac{4}{3x}+\frac{1}{2+x}$ [2]

$$\frac{4}{3x}+\frac{1}{2+x}=\frac{4(2+x)}{3x(2+x)}+\frac{3x}{3x(2+x)} \ldots [M1]$$
$$=\frac{8+4x+3x}{3x(2+x)}$$
$$=\frac{8+7x}{3x(2+x)} \ldots\ldots\ldots\ldots\ldots\ldots [A1]$$

(b) $\frac{3xy^3}{8z^2}\div\frac{9y^2}{10xz}$ [2]

$$\frac{3xy^3}{8z^2}\div\frac{9y^2}{10xz}=\frac{3xy^3}{8z^2}\times\frac{10xz}{9y^2} \ldots\ldots [M1 \text{ for cancelling}]$$
$$=\frac{5x^2y}{12z} \ldots\ldots\ldots\ldots\ldots [A1]$$

(c) $\frac{3}{2x-1}-\frac{6x-1}{(2x-1)^2}$ [3]

$$\frac{3}{2x-1}-\frac{6x-1}{(2x-1)^2}=\frac{3(2x-1)}{(2x-1)^2}-\frac{6x-1}{(2x-1)^2} \ldots [M1]$$
$$=\frac{3(2x-1)-(6x-1)}{(2x-1)^2} \ldots\ldots [M1]$$
$$=\frac{6x-3-6x+1}{(2x-1)^2}$$
$$=\frac{2}{(2x-1)^2} \ldots\ldots\ldots\ldots\ldots [A1]$$

16 **(a)** Express $\frac{1}{x-2}\times\frac{6-x-x^2}{1-x}$ as a single fraction. [2]

$$\frac{1}{x-2}\times\frac{6-x-x^2}{1-x}=\frac{1}{x-2}\times\frac{(3+x)(2-x)}{1-x} \ldots\ldots [M1]$$
$$=\frac{1}{x-2}\times-\frac{(3+x)(x-2)}{1-x}$$
$$=-\frac{3+x}{1-x} \text{ or } \frac{-3-x}{1-x} \text{ or } \frac{3+x}{x-1} \ldots [A1]$$

(b) Hence, or otherwise, solve the equation $\frac{1}{x-2}\times\frac{6-x-x^2}{1-x}=5$. [2]

$$\frac{1}{x-2}\times\frac{6-x-x^2}{1-x}=5$$
$$\frac{3+x}{x-1}=5 \ldots\ldots\ldots [M1]$$
$$3+x=5x-5$$
$$8=4x$$
$$x=2 \ldots\ldots\ldots [A1]$$

NOTE: Strictly speaking, $x=2$ cannot be a solution, because $\frac{1}{x-2}$. Only found this out after banking in the paper.

17 It is given that $Q=\sqrt{\frac{3P-1}{2P+1}}$.

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(a) If $P = 2$, find the value of Q. [2]

$$Q = \sqrt{\frac{3(2)-1}{2(2)+1}} \ldots\ldots [M1]$$

$$= \sqrt{\frac{5}{5}}$$

$$= \sqrt{1}$$

$$= 1 \ldots\ldots\ldots\ldots\ldots\ldots [A1]$$

(b) Make Q the subject of the formula. [3]

$$Q = \sqrt{\frac{3P-1}{2P+1}}$$

$$Q^2 = \frac{3P-1}{2P+1} \ldots\ldots\ldots [M1]$$

$$Q^2(2P+1) = 3P-1$$

$$2PQ^2 + Q^2 = 3P-1$$

$$2PQ^2 - 3P = -1 - Q^2 \ldots\ldots\ldots [M1]$$

$$P(2Q^2-3) = -1-Q^2$$

$$P = \frac{-1-Q^2}{2Q^2-3} \text{ or } \frac{1+Q^2}{3-2Q^2} \ldots\ldots [A1]$$

(c) Hence, or otherwise, find the value of P when $Q = 2$. [2]

"Hence" Solution:

$$P = \frac{1+(2)^2}{3-2(2)^2} \ldots\ldots [M1]$$

$$= \frac{5}{-5}$$

$$= -1 \ldots\ldots\ldots\ldots\ldots [A1]$$

"Otherwise" Solution:

$$2 = \sqrt{\frac{3P-1}{2P+1}}$$

$$4 = \frac{3P-1}{2P+1} \ldots\ldots\ldots [M1]$$

$$8P + 4 = 3P - 1$$

$$5P = -5$$

$$P = -1 \ldots\ldots\ldots\ldots\ldots [A1]$$

18 The time taken, t minutes, to pack all the Examination Care Packs is inversely proportional to the number of students, N, involved in the packing.

If a team of 3 students take 50 minutes to pack all the Examination Care Packs, how many **more** students are needed if the packing must be completed 20 minutes earlier?

[3]

$t \propto \frac{1}{N}$

$t = \frac{k}{N}$ *or* $tN = k$

$k = (50)(3)$

$k = 150$

$\therefore tN = 150$ ..... $[M1]$

Let $t = 30$

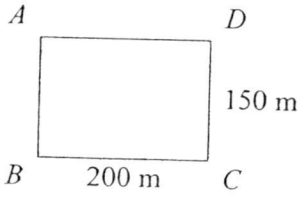
$30N = 150$

$N = 5$ ..... $[M1]$

$5 - 3 = 2$

$\therefore$ *2 more students.* ..... $[A1]$

19 The diagram below shows a rectangular field $ABCD$ (not drawn to scale) with dimensions 200 m by 150 m.



(a) Find the distance from point A to point C. [2]

By Pythagoras Theorem,

$AC^2 = 200^2 + 150^2$

$AC = \sqrt{200^2 + 150^2}$ ..... $[M1]$

$= 250$ ..... $[A1]$

$\therefore$ *distance from A to C* $= 250\ m$

(b) Mr. Cheow bought a new remote-controlled helicopter drone, and wants to fly it by standing at point A. The remote control has a maximum range of 225 m. Can the maximum range cover the whole field from where he stands? Explain why. [2]

No. [B1]

The helicopter cannot reach point C if Mr. Cheow stands at point A.
(or any acceptable answer provided by student) [B1]

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