

End of Year Examination Paper 2

INSTRUCTION TO CANDIDATES:

1. Answer **all** questions.
2. Write your answers and working in the spaces provided.
3. Omission of essential working will result in loss of marks.
4. Calculators may be used in this paper.
5. If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer correct to three significant figures. Give answers in degrees correct to one decimal place.

Marks Obtained
50

Duration: 1h 30 min

- 1** (a) A worker received a salary increase of 7%. If his new salary is \$1605, find his original salary.
- (b) The original price of a table is \$576. Due to inflation, the price increased the following month to become \$610. Find the percentage increase, giving your answer correct to 4 significant figures.

Ans: (a) \$ _____ [2]

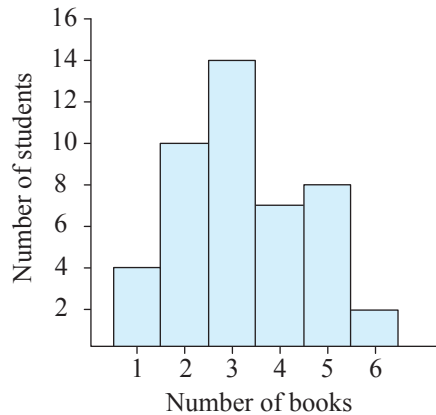
(b) _____ % [2]

- 2** (a) Simplify $\frac{4x}{x+3} \div \frac{x^2-x}{x^2+2x-3}$.
- (b) Express $\frac{2}{7} - \frac{x+4}{7}$ as a single fraction in its simplest form.

Ans: (a) _____ [3]

(b) _____ [2]

- 3 The histogram below shows the average number of books each student puts in his/her school bag everyday.

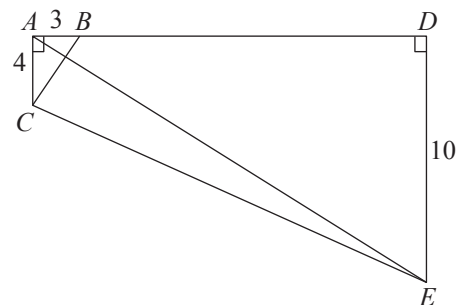


- (a) What is the fraction of students who carry an average of two books to school daily?
 (b) Find the angle of the sector on a pie chart representing five books.

Ans: (a) _____ [1]

(b) _____ ° [2]

- 4 In the figure below, $\triangle ABC$ is similar to $\triangle DEA$. Given that $AB = 3$ cm, $DE = 10$ cm, $AC = 4$ cm and $\angle BAC = \angle ADE = 90^\circ$. Find
- (a) the length of AD ,
 (b) the area of the trapezium $ADEC$,
 (c) the length of AE .

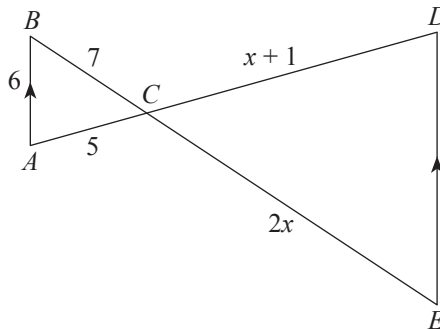


Ans: (a) $AD =$ _____ cm [2]

(b) _____ cm^2 [1]

(c) $AE =$ _____ cm [2]

- 5 In the diagram, $\triangle ABC$ is similar to $\triangle DEC$. $AB = 6$ cm, $BC = 7$ cm, $AC = 5$ cm, $CD = (x + 1)$ cm and $EC = 2x$ cm. Find
- the value of x ,
 - the length DE .



Ans: (a) $x =$ _____ [3]

(b) $DE =$ _____ cm [2]

- 6 The stem-and-leaf diagram shows the weight of 26 gold coins during a quality check.

Stem	Leaf
25	7 7 7 7 8 9
26	0 0 0 1 1 3 5 8 8 9 9
27	0 1 1 1 2 2 6 7 7

Key: 25|4 represents 25.4 grams

Find

- the ratio of the number of coins weighing less than 26 g to those weighing more than 27 g,
- the modal weight,
- the median weight.

Ans: (a) _____ : _____ [2]

(b) _____ grams [1]

(c) _____ grams [1]

7 A map has a scale of $\frac{1}{20\,000}$.

- (a) Express the scale of the map in cm : km.
- (b) Find the length of a highway on the map, if its actual length is 4 km long.
- (c) Find the actual area of a field, if its area on the map is 10 cm².

Ans: (a) _____ : _____ [1]

(b) _____ cm² [2]

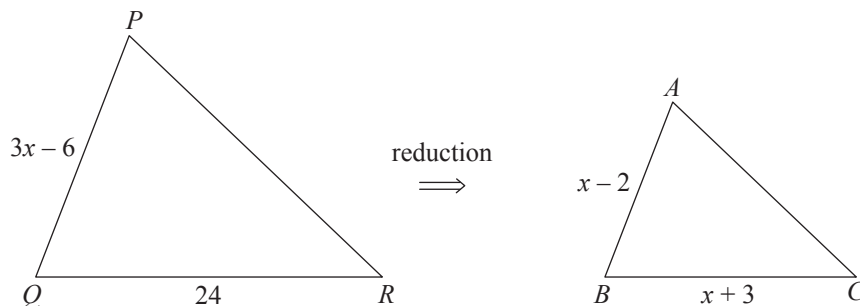
(c) _____ km² [2]

8 In the diagram, triangle ABC is a reduction of triangle PQR . The dimensions given are in cm.

(a) Show that $\frac{AB}{PQ} = \frac{1}{3}$.

(b) Hence, form an equation in terms of x and solve it.

(c) Find the length of PQ .



Ans: (a) on answer space [1]

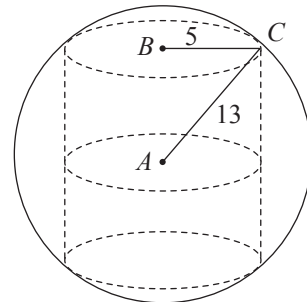
(b) $x =$ _____ [2]

(c) $PQ =$ _____ cm [1]

- 9 James and Pat took an examination and scored x marks and y marks respectively. They scored a total of 145 marks. If Pat scored 15 more marks than James,
- form a pair of simultaneous equations in x and y ,
 - find Pat's score.

Ans: (a) _____
 _____ [2]
 (b) _____ [2]

- 10 The diagram shows a solid cylinder inscribed within a spherical ball of radius 13 cm and centre A . The base radius of the cylinder is 5 cm with centre B . Calculate the
- volume of the sphere,
 - height of the cylinder,
 - volume of empty space within the sphere not occupied by the cylinder.



Ans: (a) _____ cm^3 [1]
 (b) _____ cm [2]
 (c) _____ cm^3 [1]

- 11** (a) Using a pair of compass, construct a quadrilateral $ABCD$ in which $AB = 8$ cm, $BC = 7$ cm, $CD = 6$ cm, $AD = 5$ cm and $\angle BAD = 80^\circ$.
- (b) Construct the
- perpendicular bisector of AB , l_1 ,
 - angle bisector of $\angle ABC$, l_2 .
- (c) Find, by measurement, the area of the triangle formed by AB , l_1 and l_2 .

Ans: (a) on answer space [3]

(b) on answer space [2]

(c) _____ cm^2 [2]

Solutions to:

End of Year Examination Paper 2

1. (a) Original salary = $\frac{\$1605}{107} \times 100$
 = \$1500

(b) Percentage increase = $\frac{610-576}{576} \times 100\%$
 ≈ 5.902778
 = 5.903% (4 s.f.)

2. (a) $\frac{4x}{x+3} \div \frac{x^2-x}{x^2+2x-3} = \frac{4x}{x+3} \times \frac{x^2+2x-3}{x^2-x}$
 $= \frac{4x}{x+3} \times \frac{(x+3)(x-1)}{x(x-1)}$
 = 4

(b) $\frac{2}{7} - \frac{x+4}{7} = \frac{2-(x+4)}{7}$
 $= \frac{2-x-4}{7}$
 $= \frac{-x-2}{7}$ or $-\frac{x+2}{7}$

3. (a) Total number of students
 = 4 + 10 + 14 + 7 + 8 + 2
 = 45
 Required fraction = $\frac{10}{45}$
 $= \frac{2}{9}$

(b) Angle of sector = $\frac{8}{45} \times 360^\circ$
 = 64°

4. (a) Since $\triangle ABC$ is similar to $\triangle DEA$,
 $\frac{AC}{AD} = \frac{AB}{DE}$ corr. sides are proportional

$$\frac{4}{AD} = \frac{3}{10}$$

$$3AD = 40$$

$$\therefore AD = 13\frac{1}{3} \text{ cm}$$

(b) Note that $AC \parallel DE$.

\therefore Area of trapezium $ADEC$
 $= \frac{1}{2} (AC + DE) \times AD$ $AD = \text{height of trapezium}$

$$= \frac{1}{2} (4 + 10) \times 13\frac{1}{3}$$

$$= 93\frac{1}{3} \text{ cm}^2$$

(c) Using the Pythagoras' Theorem on $\triangle ADE$,

$$AE^2 = AD^2 + DE^2$$

$$= \left(13\frac{1}{3}\right)^2 + 10^2$$

$$= \frac{2500}{9}$$

$$AE = \sqrt{\frac{2500}{9}}$$

$$= \frac{50}{3}$$

$$= 16\frac{2}{3} \text{ cm}$$

5. (a) Since $\triangle ABC$ is similar to $\triangle DEC$,

$$\frac{BC}{EC} = \frac{AC}{DC}$$

corr. sides are proportional

$$\frac{7}{2x} = \frac{5}{x+1}$$

$$7(x+1) = 5(2x)$$

$$7x + 7 = 10x$$

$$7x - 10x = -7$$

$$-3x = -7$$

$$x = \frac{7}{3}$$

$$= 2\frac{1}{3}$$

(b) $\frac{AB}{DE} = \frac{AC}{DC}$

corr. sides are proportional

$$\frac{6}{DE} = \frac{5}{2\frac{1}{3} + 1}$$

$$DC = x + 1$$

$$5DE = 6\left(2\frac{1}{3} + 1\right)$$

cross-multiplication

$$5DE = 20$$

$$\therefore DE = 4 \text{ cm}$$

6. (a) Required ratio = 6 : 8
 = 3 : 4

(b) Modal weight = 25.7 grams

(c) Median = $\left(\frac{26+1}{2}\right)^{\text{th}}$ number

= 13.5th number mean of 13th and 14th values

$$= \frac{26.5 + 26.8}{2}$$

$$= 26.65 \text{ grams}$$

7. (a) Scale = 1 cm : 20 000 cm R.F. = $\frac{1}{20\,000}$
 = 1 cm : 0.2 km 1 km = 100 000 cm

(b) Map length of highway = $\frac{4}{0.2}$ cm

$$= 20 \text{ cm}$$

(c) Area scale = $1^2 \text{ cm}^2 : 0.2^2 \text{ km}^2$
 = $1 \text{ cm}^2 : 0.04 \text{ km}^2$

$$\text{Actual area of field} = 10 \times 0.04 \text{ km}^2$$

$$= 0.4 \text{ km}^2$$

$$8. (a) \frac{AB}{PQ} = \frac{x-2}{3x-6}$$

$$= \frac{\cancel{x-2}}{3(\cancel{x-2})}$$

$$= \frac{1}{3} \quad (\text{shown})$$

$$(b) \frac{1}{3} = \frac{x+3}{24} \quad \because \frac{BC}{QR} = \frac{1}{3}$$

cross-multiplication

$$24 = 3(x+3)$$

$$24 = 3x + 9$$

$$3x = 15$$

$$x = 5$$

$$(c) PQ = 3x - 6$$

$$= 3(5) - 6$$

$$= 9 \text{ cm}$$

subst. $x = 5$

$$9. (a) x + y = 145 \quad \text{--- ①}$$

$$y = x + 15 \quad \text{--- ②}$$

$$(b) \text{Substitute ② into ①,}$$

$$x + (x + 15) = 145$$

$$2x + 15 = 145$$

$$2x = 130$$

$$x = 65$$

$$\text{Substitute } x = 65 \text{ into ②,}$$

$$y = 65 + 15$$

$$= 80$$

\therefore Pat scored 80 marks.

$$10. (a) \text{Volume of sphere} = \frac{4}{3}\pi(13^3)$$

$$= 2929\frac{1}{3}\pi$$

$$\approx 9202.77$$

$$= 9200 \text{ cm}^3 \text{ (3 s.f.)}$$

$$(b) \text{Since } \triangle ABC \text{ is a right-angled triangle, by the Pythagoras' Theorem,}$$

$$AB^2 = 13^2 - 5^2$$

$$= 144$$

$$AB = \pm\sqrt{144}$$

$$= 12 \text{ cm or } -12 \text{ cm (rej.)}$$

$$\therefore \text{Height of cylinder} = 2 \times 12 \text{ cm by symmetry}$$

$$= 24 \text{ cm}$$

$$(c) \text{Volume of empty space} = 2929\frac{1}{3}\pi - \pi(5^2)(24)$$

$$\approx 7317.816$$

$$= 7320 \text{ cm}^3 \text{ (3 s.f.)}$$

11. (a) Construction Steps

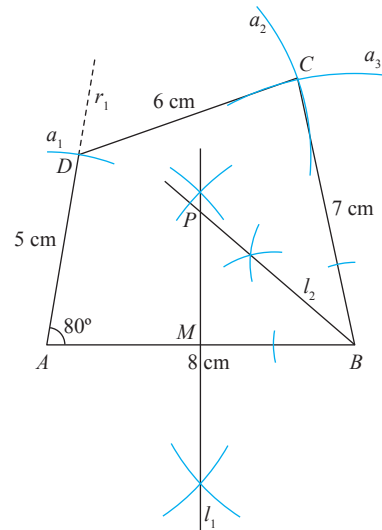
- Step 1: Draw line segment AB , 8 cm long.
- Step 2: Measure $\angle BAD = 80^\circ$ and draw a ray, r_1 , through D (dotted line).
- Step 3: Draw an arc, a_1 , of radius 5 cm from point A .
- Step 4: Label the intersection of a_1 and r_1 as ' D '.

Step 5: Draw an arc, a_2 , of radius 6 cm from point D .

Step 6: Draw an arc, a_3 , of radius 7 cm from point B .

Step 7: Label the intersection a_2 and a_3 as ' C '.

Step 8: Connect A, B, C and D to form the required quadrilateral.



(b) See diagram for the construction of l_1 and l_2 .

(c) Label the intersection of l_1 and l_2 as P .

The triangle formed by AB, l_1 and l_2 is $\triangle PMB$.

By measurement, $PM = 3.2 \text{ cm}$ ($\pm 0.1 \text{ cm}$) and $MB = 4 \text{ cm}$ ($\pm 0.1 \text{ cm}$)

$$\text{Area of } \triangle PMB = \frac{1}{2} \times PM \times MB \quad \angle PMB = 90^\circ$$

$$= \frac{1}{2} \times 3.2 \times 4$$

$$= 6.4 \text{ cm}$$