Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Measurements

Time allowed: 1 hour 10 minutes

Subject code **0625**

Physics

Questions from Paper 3, Paper 4 and Paper 6

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.

Total marks

/ 65

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.

Information

- This paper has 10 questions worth 65 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 Some liquid is poured into the measuring cylinder shown in Fig. 1.1.

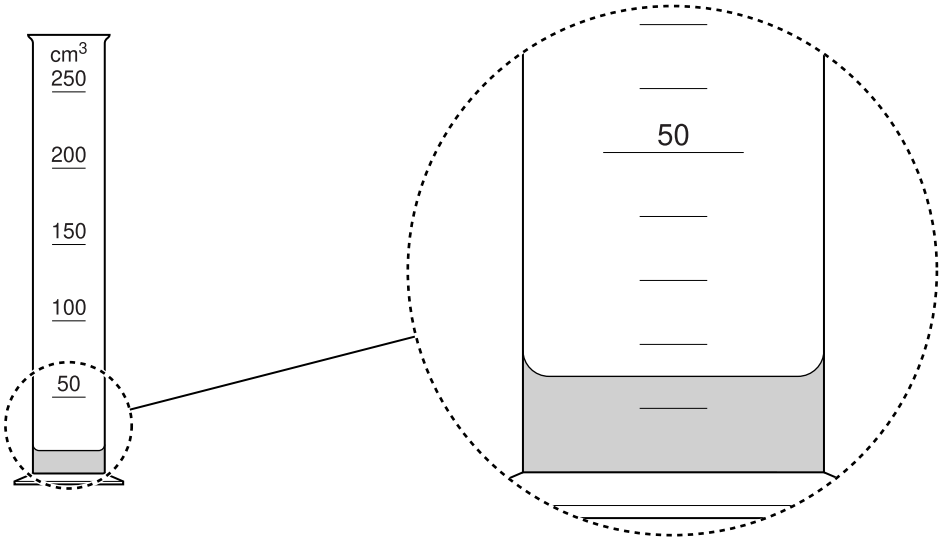


Fig. 1.1

(a) Use Fig. 1.1 to estimate the volume of the liquid.

volume = ... cm^3 [1]

(b) **On the enlarged part of Fig. 1.1**, draw the liquid level when another 25 cm^3 of liquid has been added to the measuring cylinder. [1]

(c) Explain why it would be more accurate to use a narrower measuring cylinder to measure liquid volumes like that in Fig. 1.1.

.....

.....

.....[1]

[Total: 3]

Measuring length, volume, time and temperature Click for more variations

1 **(a)** 15 ±1 (cm^3) B1

(b) level shown at 40 ±1 cm^3 OR 25 + candidate's **(a)** ±1 cm^3 on magnified figure B1

(c) idea of goes up further OR more sensitive
OR idea of small variations causing larger height differences B1
OR larger divisions / more gradations

[Total: 3]

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2 A wind turbine can be seen through the window of the IGCSE Physics class laboratory, as shown in Fig. 1.1.



Fig. 1.1

The blades on the wind turbine are turning slowly, so a student uses a laboratory stopclock to time 40 rotations of the blades.

Fig. 1.2 shows the stopclock after 40 rotations of the blades.

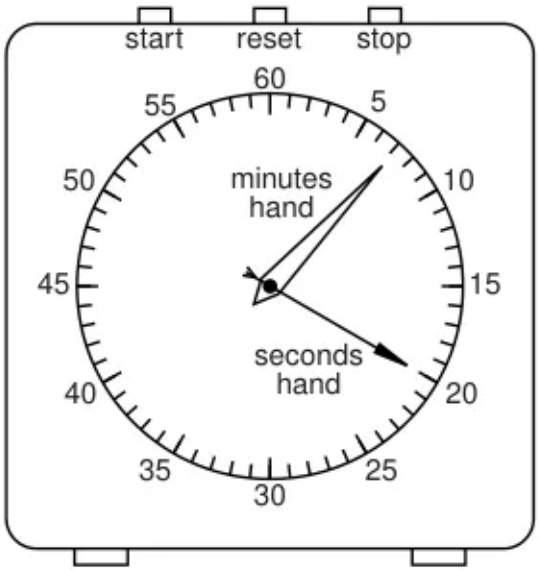


Fig. 1.2

(a) (i) State the reading on the stopclock.

reading = ... minutes ..... seconds [1]

(ii) Calculate the time, in seconds, for one rotation of the blades.

time for one rotation = ... s [3]

(b) Later in the day, the blades of the wind turbine are found to take 15 s to rotate once.

The tip of the blade travels in a circle of circumference 75 m.

Calculate the average speed of the tip of the blade.

average speed = ... m/s [3]

[Total: 7]

Measuring length, volume, time and temperature Click for more variations

2 **(a)** **(i)** 7 minutes 20 seconds B1

(ii) 440 (s) C1
division by 40 C1
11 (s) A1

(b) (speed =) distance/time in any form C1
75/15 C1
5 (m/s) A1
Note: 6.8 (m/s) gains 2 marks as correctly using time 11(s) from **(a)**

[Total: 7]

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3 A student uses a rule to measure a thin piece of wire as shown in Fig. 1.1.

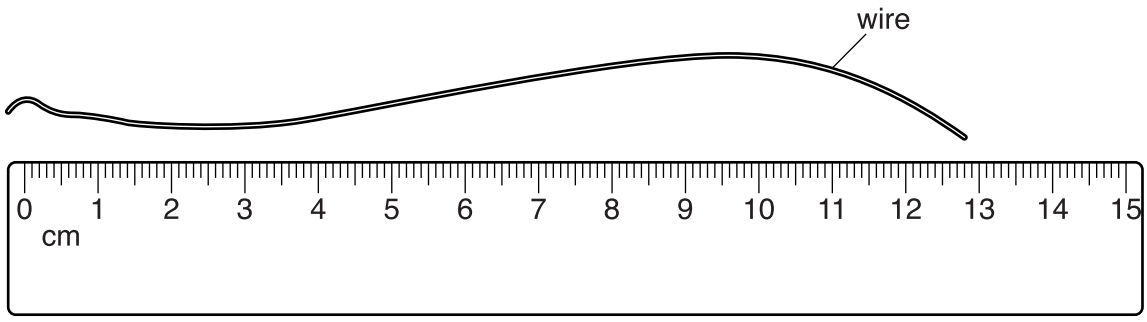


Fig. 1.1

The student records the length of the wire as 12.8 cm.

(a) State two errors in the student's measurement of the length of wire.

1. .....

.....

2. .....

.....

[2]

(b) The student is asked to measure the thickness of the wire using the same ruler. The student does this by bending a short length of the wire and measuring distance *x* as shown in Fig. 1.2.

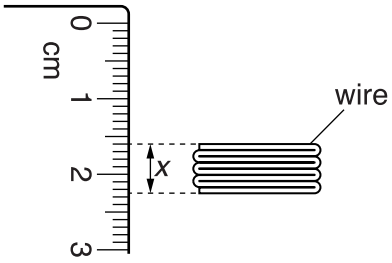


Fig. 1.2

(i) Use the ruler in Fig. 1.2 to determine the distance *x*.

distance *x* = ... cm [1]

(ii) Calculate the average thickness of the wire, **in mm**. Give your answer correct to two significant figures.

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average thickness of wire = ... mm [3]

[Total: 6]

Measuring length, volume, time and temperature Click for more variations

3 **(a)** any **two** from: B2
wire not starting at 0 cm
wire not straight
wire away from / not close to rule

(b) **(i)** 0.65 (cm) B1

(ii) candidate's **(b)(i)** / 8 C1
0.8125 OR 0.813 OR e.c.f. C1
0.81 A1

[Total: 6]

4 A student measures the diameter of some identical steel balls. Fig. 1.1 shows the arrangement she uses.

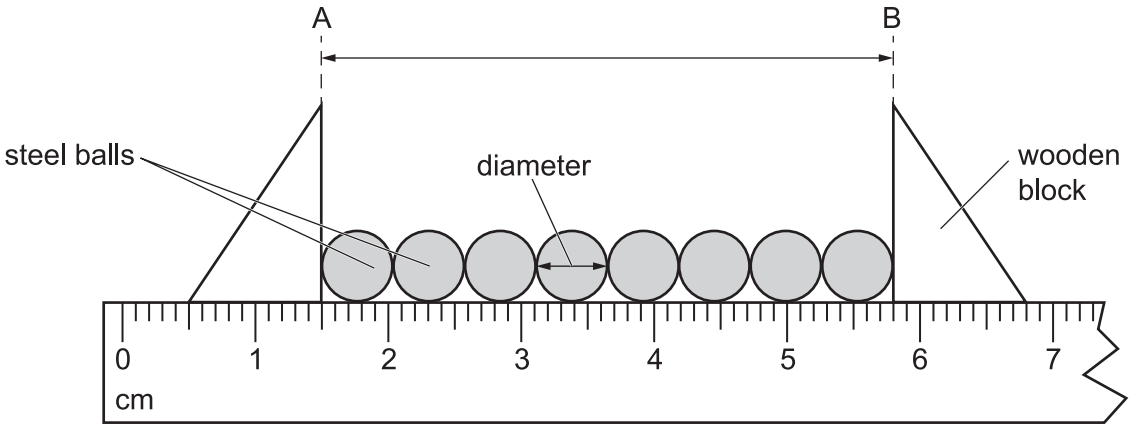


Fig. 1.1 (not to scale)

(a) **(i)** Using the ruler in Fig. 1.1, determine the distance AB on Fig. 1.1.

distance AB = ... cm [2]

(ii) Use the distance AB to determine the diameter of one steel ball.

diameter of one steel ball = ... cm [2]

(b) The mass of some steel balls is 54 g and the total volume of these steel balls is 6.9 cm^3.

Calculate the density of the steel.

density of steel = ... g/cm^3 [3]

[Total: 7]

Density Click for more variations

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4(a)(i)	4.3 (cm)	**A2**
	5.8 (– 1.5)	**C1**
4(a)(ii)	**(a)(i)** ÷ 8 correctly evaluated (0.54 (cm) if 4.3 cm used)	**A2**
	(a)(i) ÷ 8	(C1)
4(b)	7.8 (g / cm^3)	**A3**
	54 ÷ 6.9	(C2)
	$D = m \div v$ in any form	(C1)

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5 Fig. 1.1 shows a dripping tap and a measuring cylinder. The water drops all have the same volume. The drops fall from the tap at equal time intervals.

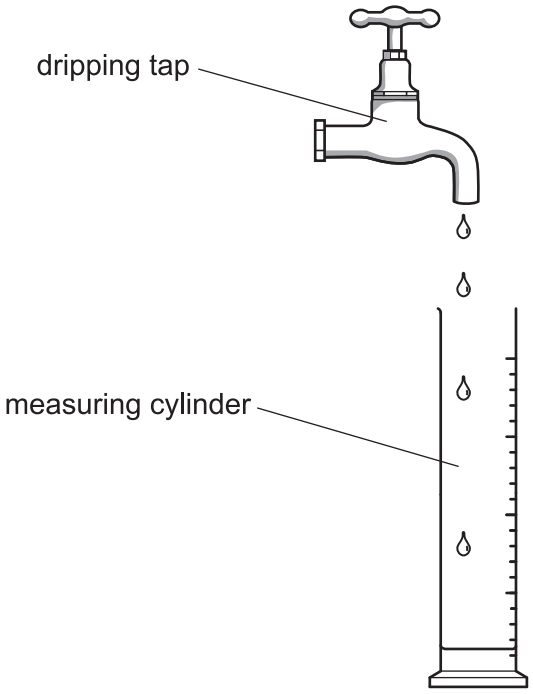


Fig. 1.1 (not to scale)

(a) (i) The student collects 200 of the drops in a measuring cylinder. The total volume collected is 60 cm^3.

Calculate the average volume of **one** drop of water.

volume = ... cm^3 [3]

(ii) Another student uses a stop-watch to measure the time taken for the tap to produce 200 drops. Fig. 1.2 shows the time reading on the stop-watch.



Fig. 1.2

Determine the time, in seconds, for the tap to produce 200 drops.

time = ... s [2]

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(iii) Determine the average time interval between one drop starting to fall and the next drop starting to fall.

time interval = ... s [2]

(b) Fig. 1.3 shows the volume of water collected in the measuring cylinder by another student.

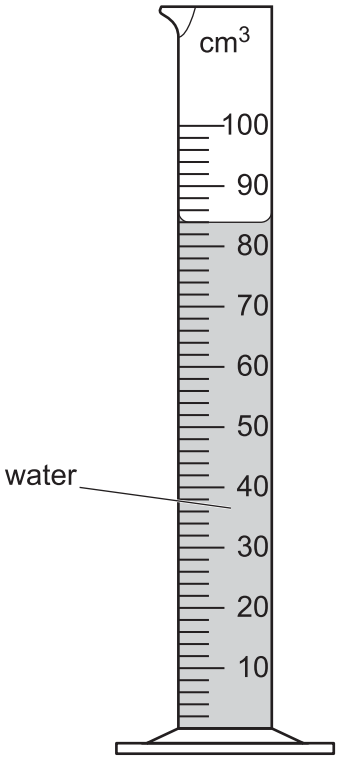


Fig. 1.3

Determine the volume of water in the measuring cylinder in Fig. 1.3.

volume = ... cm^3 [1]

[Total: 8]

Measuring length, volume, time and temperature Click for more variations

Reduced to 77% to fit the page (wider than A4).

5(a)(i)	0.3(0) (cm^3)	**A3**
	(average volume of one drop) = 60 ÷ 200	**(C2)**
	total volume = number of drops × (average) volume of one drop	**(C1)**
5(a)(ii)	226.5 (s)	**A2**
	180 (+ 46.5 =)	**(C1)**
5(a)(iii)	1.1 (s)	**A2**
	time for one drop = total time ÷ no of intervals	**(C1)**
5(b)	84 (cm^3)	**B1**

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6 The class is investigating the motion of a pendulum.

Fig. 4.1 shows the apparatus.

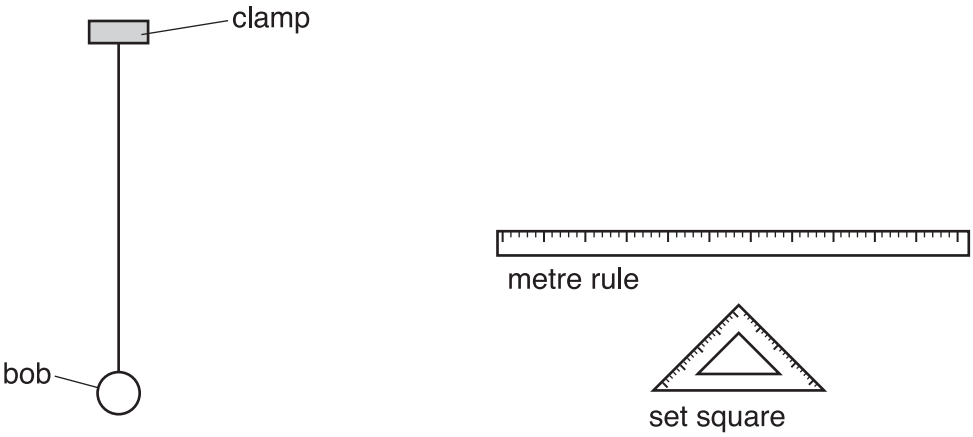


Fig. 4.1

(a) (i) On Fig. 4.1, show clearly the length l of the pendulum. [1]

(ii) Use Fig. 4.2 to explain how you would measure the length l accurately. You may draw on the diagram.

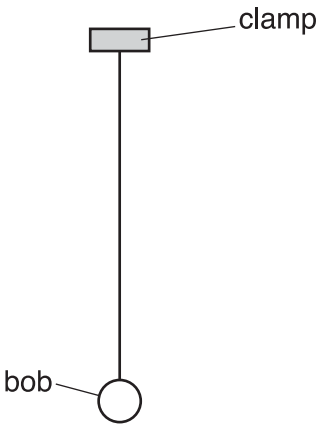


Fig. 4.2

.....

.....

.....

.....

.....[2]

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(b) A student determines the period T of the pendulum. The period is the time taken for one complete oscillation. The student measures the time t for 20 oscillations.

Fig. 4.3 shows the time t.



Fig. 4.3

(i) Calculate the period T of the pendulum.

T = ...[1]

(ii) Explain how measuring the time for 20 oscillations rather than one oscillation helps the student to obtain a more reliable value for the period.

.....

.....

.....[2]

(c) The student wants to determine a value for the acceleration of free fall from his results. He needs the value of T^2 to do this.

Calculate T^2.

Give your answer to a suitable number of significant figures and include the unit.

T^2 = ... [2]

[Total: 8]

Measuring length, volume, time and temperature Click for more variations

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6(a)(i)	*l* shown clearly from bottom of clamp to centre of bob	**1**
6(a)(ii)	Any 2 from: Metre rule close to pendulum Measurement from bottom of clamp Set-square used as a horizontal reference	**2**
6(b)(i)	1.01(1)	**1**
6(b)(ii)	Any 2 from: Idea of averaging Reaction time / judgement of when to stop / start (owtte) Reduces effect of error / spreads error over 20 swings (owtte)	**2**
6(c)	1.02(212) with 2, 3 or 4 significant figures	**1**
	unit s^2	**1**
	Total:	**8**

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7 The period of the vertical oscillations of a mass hanging from a spring is known to be constant.

(a) A student times single oscillations with a stopwatch. In 10 separate measurements, the stopwatch readings were:

1.8 s, 1.9 s, 1.7 s, 1.9 s, 1.8 s, 1.8 s, 1.9 s, 1.7 s, 1.8 s, 1.8 s.

What is the best value obtainable from these readings for the time of one oscillation? Explain how you arrive at your answer.

best value = ...

explanation .....

.....

..... [1]

(b) Describe how, using the same stopwatch, the student can find the period of oscillation more accurately.

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 5]

Measuring length, volume, time and temperature Click for more variations

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7 **(a)** Period: 1.81 s OR 1.8 s as mean value
OR 1.8 s as most common reading / the mode B1

(b) Time a minimum of 2 (successive) oscillations B1
Divide result by the number of oscillations B1
OR
Count no. of oscillations in at least 20 s (B1)
Divide the time by the number of oscillations
OR Divide no. of oscillations by time and find reciprocal (B1)
2 of:
Repeat (several times) and find mean
Time with reference to fixed / fiducial point or top or bottom of oscillation
Check / set zero of stop-watch B2
Show knowledge of what is meant by one oscillation

[Total: 5]

8 An object of weight *W* is suspended by two ropes from a beam, as shown in Fig. 1.1.

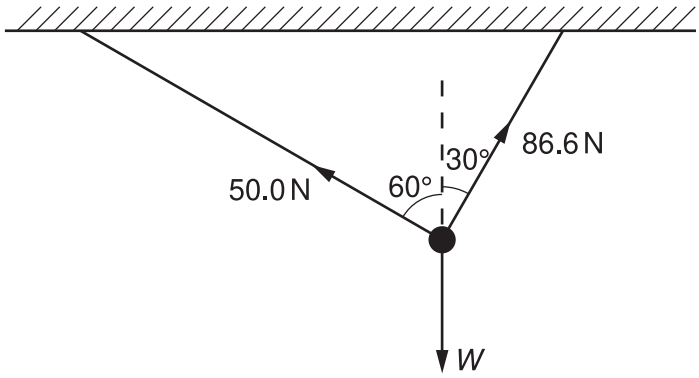


Fig. 1.1

The tensions in the ropes are 50.0 N and 86.6 N, as shown.

(a) In the space below, draw a scale diagram to find the resultant of the two tensions.

Use a scale of 1.0 cm = 10 N.

Clearly label the resultant. [3]

(b) From your diagram, find the value of the resultant.

resultant = ... [1]

(c) State the direction in which the resultant is acting.

..... [1]

(d) State the value of *W*. *W* = ... [1]

[Total: 6]

Scalars and vectors Click for more variations

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8 **(a)** (parallelogram or triangle may have any orientation)
NOT a copy of Fig. 1.1
two sides at right angles, by eye B1
one side longer than the other B1
diagonal or completion of triangle drawn **and** labelled "resultant" OR R
Ignore numerical values. Condone arrows in wrong direction B1

(b) 98 N – 102 N B1
(accept value found by calculation)

(c) (vertically) up/opposite to W NOT North B1

(d) his **(b)** OR correct value calculated B1
ignore mass

[Total: 6]

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9 **(a)** A boat crosses a river. The boat points at right angles to the river bank and it travels at a speed of 3.5 m / s relative to the water.

A river current acts at right angles to the direction the boat points. The river current has a speed of 2.5 m / s.

By drawing a scale diagram or by calculation, determine the speed and direction of the boat relative to the river bank.

speed = ...

direction relative to the river bank = ...

[4]

(b) Speed is a scalar quantity and velocity is a vector quantity.

State the names of **one** other scalar quantity and **one** other vector quantity.

scalar quantity .....

vector quantity .....

[2]

[Total: 6]

Scalars and vectors Click for more variations

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9(a)	speed = 4.3 m / s	speed = 4.3 m / s	**A2**
	correct vector triangle or rectangle drawn	use of Pythagoras' theorem e.g. $a^2 + b^2 = c^2$ OR (speed =) $\sqrt{\left(2.5^2 + 3.5^2\right)}$	(C1)
	direction = 54° or 55°	direction = 54° or 55°	**A2**
	resultant velocity vector (including arrow)	use of trigonometry to find angle e.g. tan Θ = 3.5 / 2.5	(C1)
9(b)	a scalar quantity distance, time, mass, energy, temperature		**B1**
	a vector quantity force, weight, acceleration, momentum, electric field strength, gravitational field strength		**B1**

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10 **(a)** **(i)** Mass is a scalar quantity.

State another scalar quantity.

.....

(ii) Force is a vector quantity.

State another vector quantity.

.....

[2]

(b) A boat is floating on still water.

The mass of the boat is 290 000 kg. A resultant force of 50 kN acts on the boat.

Calculate the acceleration of the boat.

acceleration = ...[3]

(c) Fig. 2.1, not to scale, shows the view from above of the boat, now on a fast-flowing river. The boat accelerates.

Two forces are shown acting on the boat. The resultant of these forces is at right angles to the river banks.

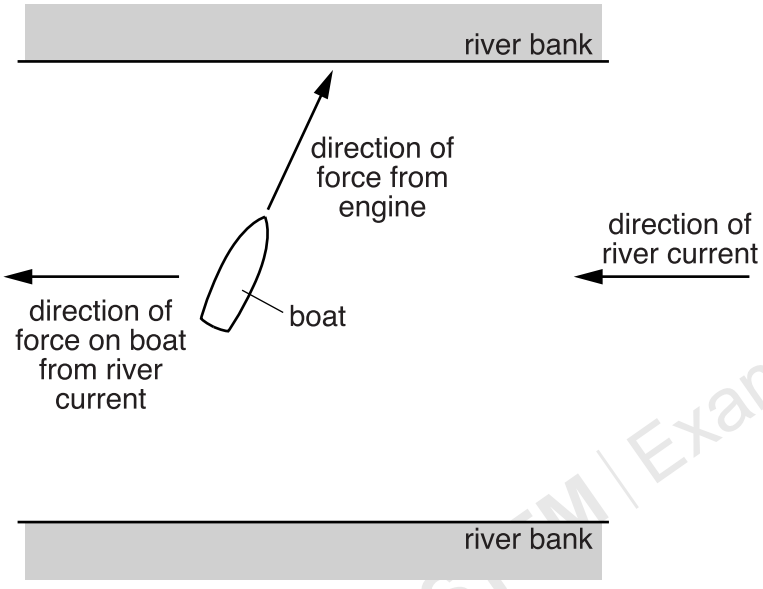


Fig. 2.1 (not to scale)

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Fig. 2.2 is an incomplete vector diagram of the forces acting on the boat.

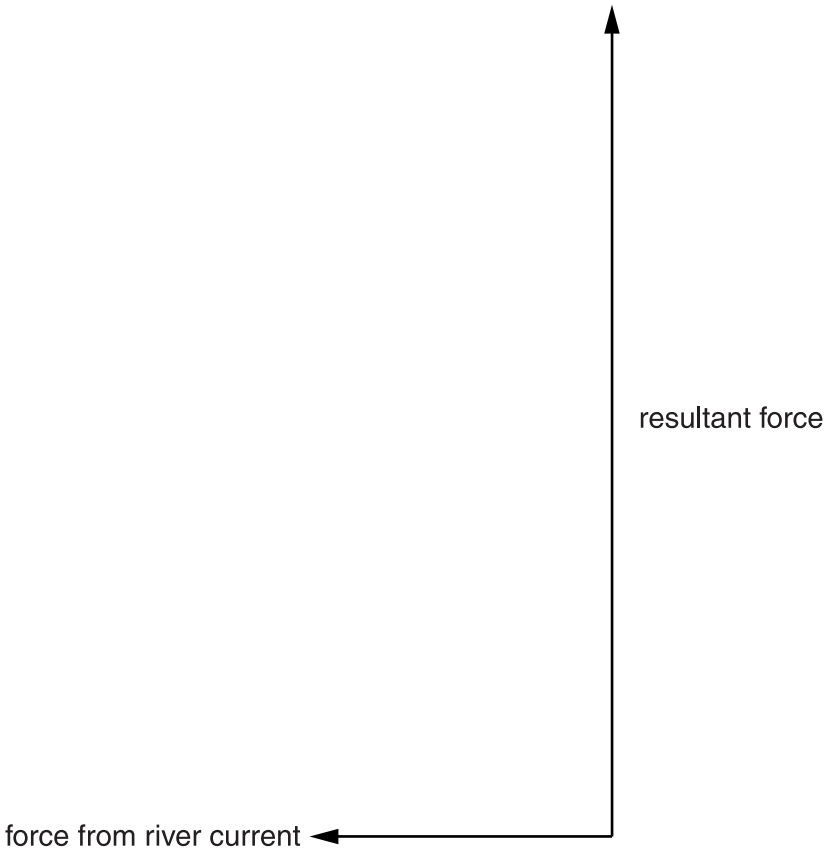


Fig. 2.2

The force from the river current is 80 kN.

(i) Determine the scale that has been used in the vector diagram.

scale is .....

(ii) On Fig. 2.2, complete the vector diagram to determine the magnitude and direction of the force from the engine. Measure the angle between the direction of the current and the force from the engine.

magnitude of force from engine = ...

angle = ...

[4]

[Total: 9]

Scalars and vectors Click for more variations

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10 **(a)** **(i)** any scalar quantity other than mass B1

(ii) any vector quantity other than force B1

(b) F = ma in any form OR (a =) F / m C1
50 000 / 290 000 OR 50 / 290 C1
a = 0.17 m / s^2 A1

(c) **(i)** 1 cm: 20 000 N / 20 kN B1

(ii) triangle completed B1
230 000 N OR 230 kN in range 220 000 N – 240 000 N / 220 kN – 240 kN B1

by calculation: 110°
OR by measurement: 108° – 112° B1

[Total: 9]

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