KNOWLEDGE CHECK

12

ROUNDING ANSWERS

The table shows the numbers of various A-level grades achieved by female and male candidates in England, Wales and Northern Ireland in one particular year (before the introduction of A∗ grades), together with the total number of entries. Using a calculator, express the numbers given for A-grades and B-grades for females as percentages of the number of female entries, and the numbers given for A-grades and B-grades for males as percentages of the number of male entries: (a) to the nearest percent, (b) to one decimal place, (c) to two decimal places. Which of these seems the most appropriate way to give the percentages?

Grades	A	B	C	D	E	N	U	No of entries
Females	58364	67566	75318	70680	54849	31673	27811	386261
Males	57125	57469	63664	61580	48178	29270	26842	344128

ANSWERS TO KNOWLEDGE CHECK 12

a) Females: A-grades 15%, B-grades 17%. Males: A-grades 17%, B-grades 17%.

b) Females: A-grades 15.1%, B-grades 17.5%. Males: A-grades 16.6%, B-grades 16.7%.

c) Females: A-grades 15.11%, B-grades 17.49%. Males: A-grades 16.60%, B-grades 16.70%. It is probably appropriate to give the results to one decimal place, as in (b).

DISCUSSION AND EXPLANATION OF KNOWLEDGE CHECK 12

We often find ourselves in the position of having more figures in the result of a mathematical calculation than we can usefully use. A teacher calculating the result of a 3.5% increase in her salary of £21,565 might get the answer 22319.775 on her calculator, but would probably think of it as 'about £22,300'. In such circumstances we often round answers to the nearest some-thing, such as, in this case, to the nearest hundred pounds. Not always, of course. If I was calculating how many 68-seater buses I needed for 370 pupils and adults going on a school trip (370 ÷ 68 = 5.4411764 on my calculator), then rounding to the nearest whole number (5) would result in having to leave 30 passengers behind! The first important consideration, therefore, is the context that gave rise to the calculation. Especially when handling statistical data, however, it will often be appropriate to round answers to the nearest something, as in the example in this knowledge check.

My calculator gives the proportion of A-grades for males to be 16.599928%. To round this to the nearest whole percent, we have to choose between 16% and 17%. Halfway between these is 16.5%. The answer is larger than this, so we round up to 17%. To round 16.599928% to one decimal place, we have to choose between 16.5% and 16.6%. Halfway between these is 16.55%. The answer is larger than this, so we round up to 16.6%. To round 16.599928% to two decimal places, we have to choose between 16.59% and 16.60%. Halfway between these is 16.595%. The answer is larger than this, so again we round up, to 16.60%. Notice that it is important to give this answer as 16.60%, not just 16.6%, to indicate that it is correct to two decimal places.

What about rounding the proportion of A-grades for females (15.1099904%)? To the nearest percent we round down to 15%. To one decimal place we round own to 15.1%. Rounding to two decimal places we have to choose between15.10% and 15.11%. Halfway between these is 15.105%. The answer is larger than this, so we round up to 15.11%.

In deciding how many places to round to, we have to make sure we retain enough information to discriminate between different answers, but not so much that the figures become meaningless.

SUMMARY OF KEY IDEAS

- To round an answer to a given number of decimal places:

  - first decide between which two values with that number of decimal places the answer lies (e.g. 5.6481 lies between 5.64 and 5.65, to two decimal places)

  - then note what comes halfway between these two values (e.g. 5.645)

  - if your answer is greater than this, round up; if it is less, round down (5.6481 is greater than 5.645, so round up to 5.65).

- Always consider the context that gave rise to the calculation before rounding the answer.

- Give enough figures in the rounded results to be able to discriminate effectively between the data; but not so many that the data is difficult to take in and evaluate at a glance.

FURTHER PRACTICE

12.1 Using a calculator, express the proportions of C-grades, D-grades, E-grades and N-grades in the table in Knowledge Check 12 as percentages, rounding them to one decimal place.

12.2 Why would it not be appropriate to give these proportions to the nearest whole percent? For example, look at the male and female results for D-grades and those for N-grades.